

What is claimed is:

1 1. A method of manufacturing a microelectromechanical device having a
2 mechanical structure and a periphery area that are disposed over a substrate and in a
3 chamber which is formed, at least in part, by a thin film encapsulation structure, the method
4 comprising:

5 forming the mechanical structure;

6 forming the periphery area wherein the periphery area includes a plurality of gaps
7 therein; and

8 sealing the chamber by depositing the thin film encapsulation structure.

1 2. The method of claim 1 wherein sealing the chamber by depositing the thin film
2 encapsulation structure includes:

3 depositing a sacrificial layer around at least a portion of the mechanical structure
4 and the periphery area;

5 depositing a first encapsulation layer over the sacrificial layer;

6 forming at least one vent through the first encapsulation layer to allow removal of at
7 least a portion of the sacrificial layer;

8 removing at least a portion of the sacrificial layer from the mechanical structure and
9 the periphery area; and

10 depositing a second encapsulation layer over or in the vent to seal the chamber.

1 3. The method of claim 2 wherein the substrate includes a sacrificial layer, and
2 wherein removing at least a portion of the deposited sacrificial layer from the mechanical

3 structure and the periphery area further includes removing at least a portion of the
4 sacrificial layer of the substrate that is disposed beneath the mechanical structure and the
5 gaps of the periphery area.

1 4. The method of claim 2 wherein the second encapsulation layer is a
2 semiconductor material which comprises of polycrystalline silicon, amorphous silicon,
3 silicon carbide, silicon/germanium, germanium and/or gallium arsenide.

1 5. The method of claim 2 wherein the first encapsulation layer comprises a
2 polycrystalline silicon, amorphous silicon, germanium, silicon/germanium and/or gallium
3 arsenide.

1 6. The method of claim 1 wherein the mechanical structure includes a plurality of
2 fixed electrodes that are disposed over the substrate and in the chamber, the method
3 further comprises forming the fixed electrodes wherein the fixed electrodes include a
4 plurality of gaps therein.

1 7. The method of claim 1 wherein the mechanical structure includes a plurality of
2 anchor regions that are disposed over the substrate and in the chamber, the method further
3 comprises forming the anchor regions wherein the anchor regions include a plurality of
4 gaps therein.

1 8. The method of claim 1 wherein the mechanical structure includes a plurality of
2 fixed electrodes and a plurality of anchor regions that are disposed over the substrate and
3 in the chamber, the method further comprises:

4 forming the fixed electrodes wherein the fixed electrodes include a plurality of gaps
5 therein:

6 forming the anchor regions wherein the anchor regions include a plurality of gaps
7 therein; and

8 wherein sealing the chamber by depositing the thin film encapsulation structure
9 includes:

10 depositing a sacrificial layer around at least a portion of the mechanical
11 structure, including the fixed electrodes and the anchor region, and the periphery
12 area, including the gaps therein;

13 depositing a first encapsulation layer over the sacrificial layer;

14 forming at least one vent through the first encapsulation layer to allow
15 removal of at least a portion of the sacrificial layer;

16 removing at least a portion of the sacrificial layer from the mechanical
17 structure, including from the gaps in the fixed electrodes, the anchor region and the
18 periphery area; and

19 depositing a second encapsulation layer over or in the vent to seal the
20 chamber.

1 9. A microelectromechanical device comprising:

2 a substrate;

3 a mechanical structure disposed over the substrate;

4 a periphery area disposed over the substrate, wherein the periphery area includes a
5 plurality of gaps therein;
6 a thin film encapsulation structure, disposed over the mechanical structure and the
7 periphery area, to partially define and seal a chamber.

1 10. The device of claim 9 wherein the thin film encapsulation structure includes
2 first and second encapsulation layers.

1 11. The device of claim 10 wherein the first encapsulation layer is comprised of
2 polycrystalline silicon, porous polycrystalline silicon, amorphous silicon, silicon carbide,
3 silicon nitride, silicon/germanium, germanium, or gallium arsenide.

1 12. The device of claim 10 wherein the second encapsulation layer is comprised
2 of polycrystalline silicon, porous polycrystalline silicon, amorphous silicon, germanium,
3 silicon/germanium, gallium arsenide, or silicon carbide.

1 13. The device of claim 9 wherein the mechanical structure includes plurality of
2 fixed electrodes, wherein the fixed electrodes include a plurality of gaps therein.

1 14. The device of claim 9 wherein the mechanical structure includes plurality of
2 anchor regions, wherein the anchor regions include a plurality of gaps therein.

1 15. The device of claim 9 wherein the mechanical structure is a resonator
2 including at least one fixed electrode, and anchor region, and at least one moveable
3 electrode that is physically connected to an anchor region and adjacent to the fixed
4 electrode, and wherein the fixed electrode and the anchor region include a plurality of gaps.

1 16. A microelectromechanical device comprising:
2 a substrate;
3 a mechanical structure disposed over the substrate wherein the mechanical
4 structure includes moveable and fixed electrodes;
5 a periphery area disposed over the substrate;
6 a getter area, disposed in predetermined portions of the periphery area and the fixed
7 electrodes;
8 a chamber, wherein the mechanical structure, periphery area and the getter area are
9 at least partially disposed in the chamber and wherein the getter area is exposed to fluid in
10 the chamber; and
11 a thin film encapsulation structure, disposed over the mechanical structure, the
12 periphery area and the getter area, wherein the encapsulation seals the chamber.

1 17. The device of claim 16 wherein the getter area includes gaps in portions of
2 the periphery area and the fixed electrodes.

1 18. The device of claim 16 wherein the getter area is capable of capturing
2 impurities, atoms or molecules that are out-gassed from materials contained within the
3 chamber.

1 19. The device of claim 16 wherein the mechanical structure is a resonator.

1 20. The device of claim 19 wherein the thin film encapsulation structure includes
2 first and second encapsulation layers.

1 21. The device of claim 20 wherein the first encapsulation layer is comprised of
2 polycrystalline silicon, porous polycrystalline silicon, amorphous silicon, silicon carbide,
3 silicon nitride, silicon/germanium, germanium, or gallium arsenide.

1 22. The device of claim 20 wherein the second encapsulation layer is comprised
2 of polycrystalline silicon, porous polycrystalline silicon, amorphous silicon, germanium,
3 silicon/germanium, gallium arsenide, or silicon carbide.